VIRGINIA WILDLIFE

DECEMBER 1986 ONE DOLLAR

I've decided to become a proponent of *pests*. You know, the kind of pests that farmers and ranchers worry about, the kind gardeners curse during the summer, and homeowners trap all year long. Coyotes, wolves, beavers, groundhogs, mice and moles. I'm taking up for animals whose blessed abundance is an aggravation. Why? Because I figure they might have an answer that we're looking for—the one that's called *adaptation to the environment.*

The way I see it, these critters just may be sitting there with the know-how locked behind those beady little eyes of theirs that we need to help us figure out how the heck we can help the languishing quail populations in the state, or the loggerhead shrike, or the northern flying squirrel or the red-cockaded woodpecker. Because, once upon a time, many of our "nuisance" beasts figured out a way to come from near or total extinction in the state (take the white-tailed deer or beaver, for example) and flourish into pests of grand proportions.

Naturally, in the beginning we encouraged their growth. Wildlife managers are in the business of manipulating populations; we excel at nursing species from near extinction into stablilized, healthy populations. But we don't claim to know all the answers. More than once a species has shown us that it can break all the rules. More than once a creature waved a furry paw or claw in the face of a stuffy biologist who believed he had written the definitive text on their behavior. On their needs and desires.

Look at the wild turkey, for example. Over forty years ago, wildlife managers lamented the demise of this noble bird, certain that it would never again reach the grand proportions it sustained in colonial times when the mature forests covered the Commonwealth. Well, that bird sure fooled us. With a little trapping and relocating, the species took off. It *adapted* to a new set of environmental circumstances, something we never dreamed it would do.

But, once a species start to become overabundant, their good fortune usually turns into a nightmare for us. It means bears in trash cans, deer in soybeans, and beavers in rhododendrons. They become a nuisance to us because of the numbers. Frankly I wouldn't be surprised to hear some farmer blaspheme the honorable wild turkey or noble Canada goose for their admirable numbers in the state sometime soon.

We curse them because they have done something quite remarkable, though in natural terms, it is quite ordinary, I suppose. They have survived and they have multiplied. They have survived our irresponsible habitat alterations and human population booms. They have shown resiliency in the face of stress and the hard times of low numbers. They have adapted to changes in their environment with gusto. Look at the coyote. Used to be there were none to be found east of the Mississippi. Now the bugger has invaded the Old Dominion, and is worrying the devil out of sheep ranchers and game biologists. Beats our understanding.

To my way of thinking, the sad part about these wildlife success stories is that nobody much studies these marvelous examples of adaptation anymore, unless it's to figure how to get rid of them. And, I guess that makes sense. I realize that there are more vital matters to be studied. We truly are faced with several wildlife crises on our hands, with a limited amount of time, money and people to deal with them.

So, I will leave those more pressing studies to greater minds than mine. In the meantime, I will go quietly about my business of studying our pests. I shall do my own population dynamics studies and habitat trends analyses. I believe I will begin with the lowly groundhog and then proceed on to the "trash duck" mallard. And, who knows? Perhaps someday I'll get an inkling about what it takes to survive.

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Color separations and printing by Donihe Graphics, Kingsport, Tennessee

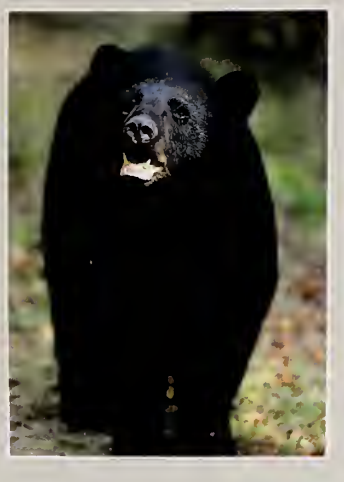
Virginia Wildlife (ISSN 0042 6792) is published monthly by the Education Division of the Virginia Commission of Game and Inland Fisheries, Box 11104, 4010 West Broad Street, Richmond, Virginia 23230-1104. Second class postage paid at Richmond, Virginia and additional mailing offices. POSTMASTER: Send address changes to *Virginia Wildlife*, P.O. Box 11104, Richmond, Virginia 23230-1104.

Subscription department: 804/257-1251. Rates: one year, $7.50; three years, $18.00; back issues $1.00 each subject to availability.

Submission guidelines available upon request. The Commission accepts no responsibility for unsolicited manuscripts, photographs or artwork. Permission to reprint material from *Virginia Wildlife* must be obtained from the writer, artist or photographer as well as the managing editor.

Observations, conclusions and opinions expressed in *Virginia Wildlife* are those of the author and do not necessarily reflect those of the members or staff of the Commission of Game and Inland Fisheries.

December Issue



This month's issue is dedicated to the black bear in Virginia. May the numbers of this gentle bruin increase. See page 12 for an in-depth look at this animal; photo by Lynda L. Richardson..

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Back cover: Reddish Knob at sunset, an area known for its bears; photo by Lynda L. Richardson.

by Nancy Hugo
photos by Kerry Givens

A HOUSING

Virginia's endangered bats are having a rough time finding places to live.

Most stories about bats deal with how to get rid of them. Dr. Virginia Dalton at Radford University is trying to figure out how to keep them. "Bats Need Friends" reads one of the stickers on her poster-covered wall. "Bats—Let 'Em Hang Free" reads another. Even her coffee mug has a picture of a bat hanging next to the inscription: "Do not disturb."

The bats Dalton is trying to protect with the help of the Game Commission's Nongame and Endangered Wildlife fund are three species of endangered bats found in Virginia—the Indiana bat, the grey bat, and the Virginia big-eared bat. They are all cave bats that live at least part of the year in limestone caves in southwestern Virginia.

Four caves in the southwestern part of the state have summer colonies of grey bats—a species whose population has declined 80 percent in 20 years. About 10 caves have winter populations of the endangered Indiana bat, a bat vulnerable because of its tendency to concentrate large colonies in only a few caves. And the Virginia big-eared bat, an endangered species numbering only 6,000 to 8,000 individuals, has one hibernating colony and one maternity colony in southwestern Virginia caves.

The greatest threats to their existence are pesticide poisoning, loss of habitat, and human disturbance. Enormous reductions in bat populations occurred in the 1960s when bats fed on insects contaminated with DDT, and bats are still succumbing to pesticide poisoning today. What makes them so vulnerable is their enormous appetites—a grey bat may eat 3,000 insects in a single night—and their low birth rates. Most bats have only one pup each year, and a female grey bat has no offspring at all until she is 2 years old.

It is loss of habitat and human disturbance that most concern Dalton,

SHORTAGE

Although not endangered, the little brown bat resembles the rare Indiana bat, and also requires a quiet hibernating cave. (photo below)

A good cave is hard to find.

however. Virginia's endangered bats hibernate in caves where they can survive the winter on stored body fat. But not just any cave will do. Indiana bats, for example, require caves with a temperature between 4°-8°C and with relative humidity of around 87 percent. Because their roosting requirements are so restrictive, over half of the total population of Indiana bats are found in only two caves. A natural disaster like a roof collapse or flooding could wipe out a large part of the entire population.

Cavers, tourist activity, and activity from nearby developments also often shatter the bats' seclusion. According to Dalton, there are thousands of caves in Virginia but only about one hundred of those are congenial to bats. Unfortunately, what makes them attractive to bats—their size and complexity—also makes them attractive to cavers. About five Virginia caves have been closed to the public to protect endangered bat populations.

Occasionally there are stories of deliberate damage to bats like the afternoon massacre by three boys who tore 10,000 hibernating Indiana bats from the ceiling of a Texas cave and stoned and trampled them to death. More often, the bats are disturbed inadvertently, but the effect is just as fatal.

According to Dalton, cavers—and she is one herself—tend to think they are the only visitors to particular caves, and they assume, because there are no bat carcasses on the floor when they leave that they haven't harmed the bats. Such is seldom the case. A single human entry into a hibernaculum can cause a bat to arouse and use up a 10 to 30 day supply of stored body fat. Without enough stored fat reserves to make it to spring, a bat will die of starvation before insects are available again in the spring.

"That's why bats hibernate in caves," says Dalton. "They need places that are

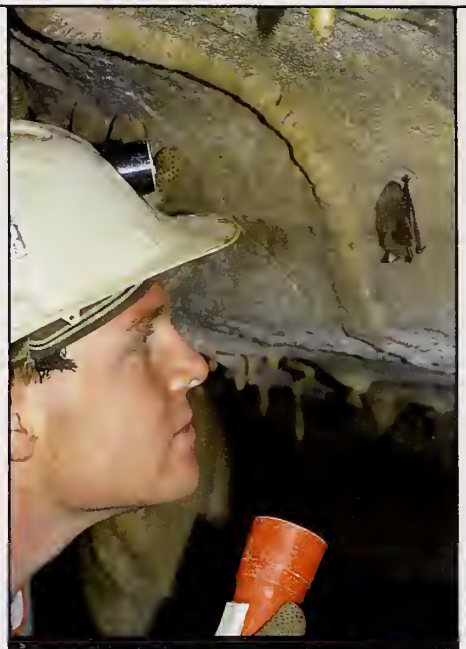
dark and quiet. A noisy, well-lit cave disturbs this dark refuge."

Dalton, the Virginia Game Commission, and other interested conservationists including the Nature Conservancy are trying to protect caves with known colonies of endangered bats. Sometimes protection comes in the form of signs, which may or may not be heeded. Sometimes protection comes in the form of gates, which may hold back the public but sometimes negatively affect the bats. Grey bats, in particular, will abandon a gated cave. Federal laws also protect endangered species by imposing penalities of up to a year in prison or as much as a $20,000 fine for harming or harassing endangered animals, but is it often hard to prove a bat has been harassed.

Some of the Game Commission's most effective efforts to protect bats involve cooperative agreements with private landowners to protect caves on their land. Dalton also believes secrecy also has a place in protecting caves, and she seldom mentions the name of a cave publicly unless it is a safe three states away.

Some bats like the grey bat and the Virginia big-eared bat are also vulnerable to summer disturbance because they have summer maternity colonies in caves. Here, the females give birth to pups which they nurse until they are ready to fly. When humans disturb these nursery roosts, the mothers may abort or abandon their offspring. Just shining a light on a grey bat nursery colony will cause the mothers to drop their babies to the floor.

This sensitivity to disturbance makes bats hard to study, as does just about everything else about their habits. For years, if Virginia Dalton wanted to study bats she had to stay up all night to do it. "This cave is relatively free from all hazards," she wrote in one research proposal, "except the desire to sleep." Now Dalton and her husband have a high tech solution to bat study. They use a video camera with a night vision scope to film caves lit with infrared light. Not only does the taping allow the researchers to sleep, but since the apparatus can be controlled remotely, it disturbs the bats minimally. The tape can be studied in detail later in the laboratory.



Above: *Spelunkers can disturb bats without knowing it.* ***Below:*** *An endangered big-eared bat* (Plectous townsendii).

Physically counting bats to come up with population estimates can be a problem, too. Is the bat that went into the cave the same one that just came out? And how many bats are in the cracks and crevices that researchers can't reach? Dalton believes Virginia's endangered bat populations are now stable to declining, but now and then the population figures shoot up because the researchers do a better job of counting. To count bats in the recently discovered winter colony of big-eared bats, Dalton photographed the cluster of bats on the cave ceiling, then blew up the photo and counted each bat in the cluster of over a thousand bats.

There are problems, too, at least for the uninitiated, in identifying endangered bats. The Indiana bat looks much like the common little brown bat, although the little brown bat hibernates in loose clusters and the Indiana bat hibernates in clusters as tight as 300 bats per square foot. The grey bat can be distinguished from other bats by the way his wing membrane attaches to his ankle rather than to the base of the toe as it does in other bats, but that's hardly noticeable to a casual observer. Only the Virginia big-eared bat is easy to recognize with his one-inch ears and two big lumps on his nose.

Much of Dalton's current research is part of the Virginia Game Commission's effort to learn more about endangered bats. She is surveying caves all over the southwestern part of the state checking historical reports of bat colonies, looking for new colonies, and trying to learn more about bat behavior. It's hard to protect big-eared bats, for example, when we know so little about them. When and where do they forage? Where are the males' summer roosts? We also know little about the summer quarters of Indiana bats. A few maternity colonies have been found under the flaking bark of old trees along streams, but where are the other bats during the summer? Other poorly understood phenomena include swarming and territoriality among bats. What is the purpose of the bats' late fall and early summer flights into, out of, and around certain caves? Are the juvenile bats learning migration routes or does swarming serve as a mating function since this is the time when males and females are reunited? Researchers are also investigating the possibility that each bat species stakes out a different flight zone in the air—some higher and some lower to the ground—as well as using different times for foraging.

The · Case · Against

Bats In Your Hair

Every time a bat makes a nose dive toward somebody's head, bat popularity takes a nose dive with it. But are bats getting a bum rap? Here's the evidence; you decide.

Donald Griffin was one of the first bat researchers to test bats' navigational skills. Griffin was interested in just how small an obstacle a bat could detect using the reflected sound of his ultrasonic call. From the floor to the ceiling of his Harvard laboratory, Griffin strung wires one inch apart. Then he let the bats loose. In 100 test flights, the bats averaged only 10 collisions, usually only the brush of a wing tip on wire. Smaller and smaller he made the diameter of the wire until he'd established that a bat can detect an object as small as 3/1000 of an inch thick in its path. That's smaller than a single human hair.

Bat researcher Virginia Dalton is equally convinced of bats' ability to avoid even tiny obstacles. "Just watch them flit through tree branches at night," she suggests. "They zip through the woods and avoid tree branches in an unbelievable way."

They do it by using echolocation—a way of bouncing their own calls off objects and interpreting the echoes that come back. Echolocation is the way they locate their prey and the way they can tell a fly from a forelock.

Even when he's just cruising, a bat is sending out 20 to 30 calls a second, but when he detects an obstacle or prey in his path, that rate speeds up to as many as 250 calls per second. From the echoes that come back, he can tell the shape, movement, and even the texture of the objects his voice encounters.

To judge how effective echolocation is, consider the bat's hunting prowess. A little brown bat can catch a gram of insects in an hour, and a smaller species of bat studied in the laboratory once caught 175 mosquitoes in 15 minutes. The smallest prey ever recorded for a bat was a minuscule .0002g gnat.

What you can do to protect endangered bats:

Follow the example of the National Speleological Society which instructs its members to avoid caves that harbor endangered species of bats or large numbers of any bat species during the critical periods of hibernation and nursing. Avoid hibernacula until the bats have departed in the spring; avoid nursery roosts from the last week of March through the second week of October. Report large numbers of bats to the Virginia Game Commission.

But why, if they are so good at avoiding obstacles and targeting prey, do bats seem to dive so often for our heads?

Dalton's explanation is the mosquitoes around our heads. "We attract insects and bats eat insects," she explains. Bats also have no reason to fear humans, so why not fly close?

Dalton attributes the folk saying that bats get in your hair to an encounter someone probably had somewhere, sometime when a bat got his sharp, delicate claws stuck in someone's fluffy hair. A major event, to be sure. Since then, people who've heard the saying get hysterical when bats fly close. "And hysterical people don't tell reliable stories," says Dalton.

It would be reassuring if she could say that in all her years of studying bats she'd never had one fly into her. But she can't. A bat landed on her once when she was surveying a cave and was settling in when she gently removed him.

"He had no reason to be afraid of me," she explains, "because nothing much preys on bats in caves."

One other bit of evidence also makes one pause before putting too much faith in echolocation. Bats sometimes exhibit what scientists call the Andrea Doria effect. *Andrea Doria* was the ship that sank when it struck the *Stockholm* despite radar capability to avoid it. Bats sometimes have similar collisions. Bats returning to their caves have been known to crash into objects not previously present, even though they could easily have detected them with echolocation. It seems bats use their memories—not constant echolocation—when travelling familiar paths.

How will you respond to a bat given this evidence? Chances are you'll still duck when bats are flying around. But not to worry. Chances are, no matter how hysterical your bahavior, the bats will still be able to avoid you.—*N.H.*

The endangered Indiana bat hibernates in tighter clusters than the little brown bat pictured above.

Bats may be revered in others parts of the world, but in the United States they're feared. We think of them as spooky vermin that at best land in your hair and at worst carry rabies. In fact, the chances of a bat landing in your hair are infinitesimal and the chances of dying from rabies contracted from a bat are equally slim. One bat researcher calculates the chances of dying from rabies contracted from a bat "as good as the chance of being killed by being run over by a blue-painted Mack pulp truck driven by a pipe-smoking 65-year-old woman who owns six beagles." Bats do carry rabies but only half of one percent of American bats carry the disease, and bats, for some reason, are not subject to rabies epidemics.

Bats' good points—aside from being our only flying mammals and infinitely interesting—are these. They are natural insecticides, non-polluting insect-eaters that rid the environment of millions of tons of insects each year. They are also a crucial part of fragile cave ecosystems, supporting dozens of types of bacteria and invertebrates in their guano. They have enormous potential in medical research because of their long lives (often as long as 20 years) and may give us insight into aging. Their unique reproductive sequence (the females storing the males' sperm in their bodies over the winter before fertilization in the spring) has value in our study of artificial insemination, and their sophisticated systems of echolocation for navigation have already contributed to the development of navigational aids for the blind.

Using an example from environmentalists Paul and Anne Ehrlich, Dalton likens each species of bat, like every other species of plant and animal, to the rivets holding an airborne plane together. The plane in this case is the ecosystem, and each rivet (or species) removed weakens the structure of the plane. How many rivets can be removed before the plane crashes? No one knows. Until we do, Dalton suggests we protect our endangered bat species. Besides, she adds on a personal note, "When some of us like bats, it's not fair for other people to destroy them." □

Nancy Hugo is a freelance outdoor writer who lives in Ashland.

Telling the Truth About Age

Ever wondered about that old guy who told you he finally got that old wily buck that had been sneaking around his place for years? Now you can test the truth of his words by learning how to age and sex your game.

by Bruce Ingram

It is a scene repeated many times every fall in the Old Dominion. You and your fellow hunters are standing over a nice deer, turkey, or grouse and the questions begin. If it's a deer, everyone has their own opinion about how old the trophy is. If it's a turkey or grouse, speculation begins on not only the age of the bird, but also the sex.

The problem is, there is a lot of misinformation being passed around. A big buck with a huge rack is bound to be a wily old deer, right? It's sure to have been around for years, outsmarting hunters year after year. Why, he probably even outsmarted your grandaddy, right?

Well, you're wrong.

Most sportsmen insist they can determine the age of a buck by its antler development. Simply stated, it's impossible to tell a buck's age by its antlers. A 1½-year-old may still be a spike, or it may have developed into a 10-pointer if conditions for growth were ideal. Conversely, an 8-year-old buck in poor condition might have

only four points.

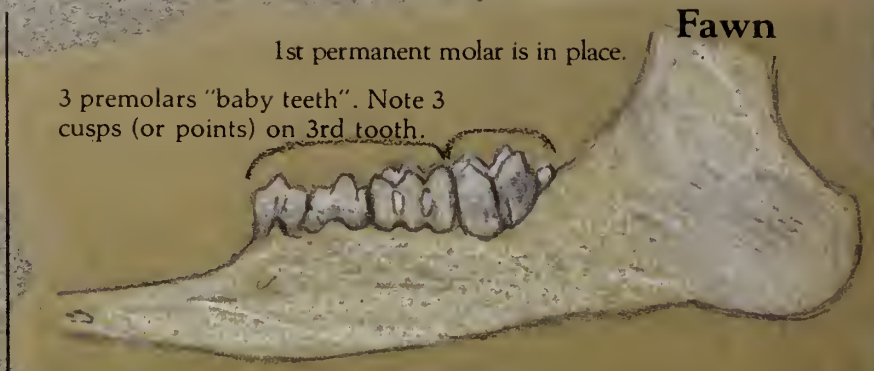
The best way to age a deer is by its teeth. Deer possess "milk" teeth (which they lose) and permanent teeth. A deer under 2 years is aged by tooth development. Those older than 2 are aged by the amount of wear on their teeth. For example, a fawn will still have three milk teeth and one permanent molar. By the following year, the deer will have all three permanent molars in, and sometime between 17 and 18 months, will lose its baby teeth, including the third 3-cuspid tooth (replaced with a 2-cuspid tooth). As the deer ages, wear begins to show on its permanent teeth, which becomes progressively worse for each year a deer survives. The deer has a potential life span in the wild of about 12 years, but by then its teeth are virtually worn away and death from starvation is likely.

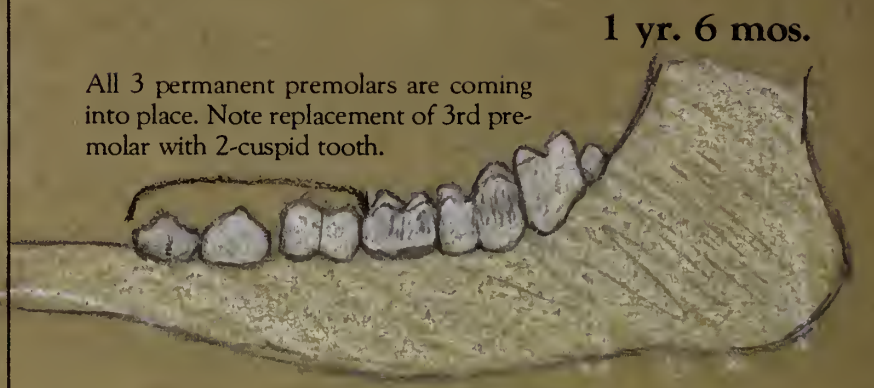
While aging deer can require some study, it is fairly easy to both age and sex a turkey. A gobbler boasts several prominent characteristics: a red wattle dangling from the chin, a white scull cap, and the bristle-like growth or "beard" hanging from the breast. Hens rarely possess beards, and when they do, these growths are very small and poorly developed.

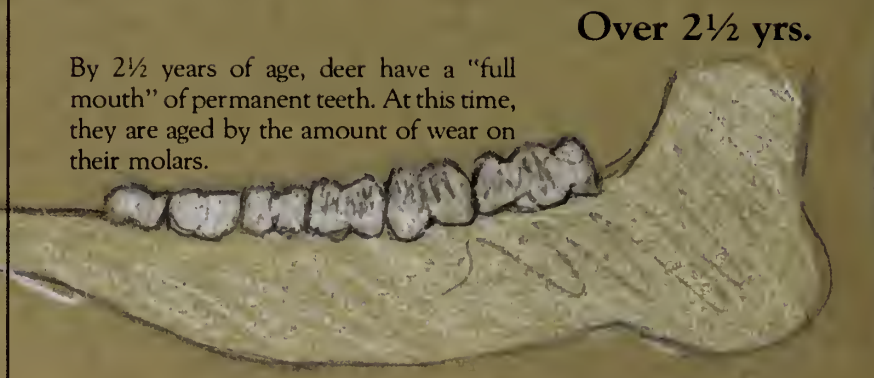
However, you can't use the head or beard method of sex identification if your bird is less than 2 years old. Instead, you can distinguish whether you've bagged a young hen or jake by its breast feathers. A jake will have scale shaped and black-tipped breast feathers, while a hen will have more rounded buff or brown-tipped ones.

To figure out whether your turkey is a young of the year or an adult bird, you can look to its tail feathers. A juvenile bird will have a tail spread that's uneven, with the central feathers being longer than the outer ones. The adult bird, however, will have an even, rounded contour to its spread tail.

If you need even more reassurance that you got an old tom, look at its number 10 primary wing feather. This is the outermost primary feather on the wing. If it's an old bird, the feather will be broadly rounded with barring to its tip. On a young bird, the black tip of the feather will be pointed and lacks the barring. A juvenile bird will retain this







As a rule, only the fall turkey hunter will be distinguishing between juvenile and adult birds, since the young of the year normally will be adults (one year old) come spring gobbler season. So, fall turkey hunters, pay attention. Note the 10th primary wing feathers above. The one on the left is a juvenile feather which will be replaced by an adult feather (right). Note the lack of barring at the tip of the juvenile feather.

10th primary feather until the spring of the next year when that feather will be replaced by the adult, more rounded, barred one.

Ruffed grouse can also be aged and sexed by their feathers, although with less certainty than turkeys. Observe a grouse's rump and tail feathers. The general rule which most outdoorsmen use is that if the tail band is complete across the tail, the bird is a male. If the band is broken on the two middle feathers, the bird is a female. Unfortunately, some 25 percent of the male birds have a broken tail band.

Another way to determine the sex of a fool hen is to measure one of the two middle feathers. If the fully grown feather is 5⅞ inches or greater, the bird is a male. If it's less than 5½ inches, the grouse is a female. Again, unfortunately, just as grouse have an annoying habit of being extremely difficult to shoot, a number of these creatures will also have measurements in between the lengths listed above. And those "in between" birds could be males or females.

A final way to sex a grouse is by removing several feathers from its lower back. These are the feathers just above the long stiff tail coverts. Males possess two or more white dots on these feathers while females have only one.

S. DeStefano, R.L. Ruff and S.R. Craven in their book *A Grouse in the Hand*, state that the key in determining whether Old Ruff is a juvenile or an adult lies in the ninth and tenth wing primaries.

"Carefully inspect the trailing edges of the two feathers near their upper tips. If the edge is smooth and curved, which is typical of freshly grown feathers, the bird is probably an adult. If the edge is straight and worn, the bird is probably a juvenile."

Why is it important to know the sex and age of any game animal? For Game Commission biologists, this information provides valuable data on reproductive success and helps them to formulate management recommendations. For the individual, it adds to the enjoyment of a day spent afield. □

Bruce Ingram is the Virginia editor for Outdoor Life *magazine and is a frequent contributor to* Virginia Wildlife.

by Dennis Martin and Gerald T. Blank, Jr.

The Gentle Bruin

The black bear is an often misunderstood, though highly prized animal in Virginia. Here is the truth about our own gentle giants.

The voice on the phone was quick and excited as the caller described a large black bear in her backyard. She was concerned about the safety of her children and the dog.

She was a little taken aback when I said I envied her good fortune and hoped she got some good pictures. As we talked she seemed relieved to learn

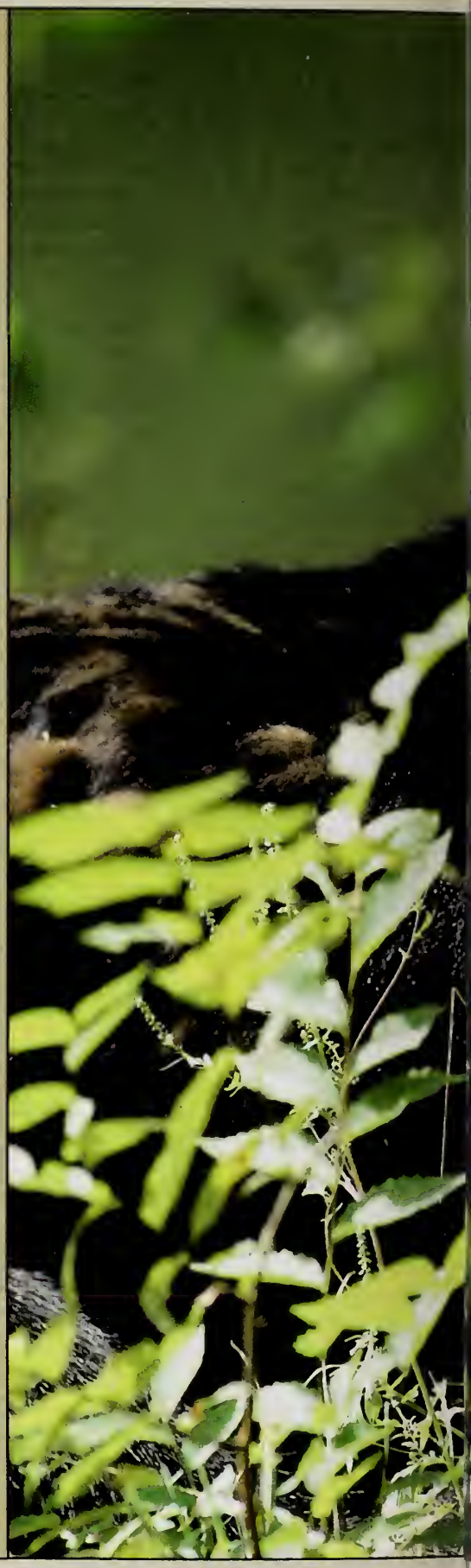


photo by Lynda L. Richardson

A Year in the Life of Dismal Swamp Bears

by Eric Hellgren and Michael Vaughan

The Great Dismal Swamp is home to more than its share of legends, many of which concern the black bear. From stories of 800-pound giants to tales of fierce battles between swamp bears and wild cattle, the black bear has been celebrated in eastern Virginia and northeastern North Carolina for nearly 300 years.

Though extensive timber harvesting, road building, and ditching since the early 1800's have altered its habitat, the Great Dismal Swamp still harbors the only black bear population in eastern Virginia, thanks in no small part to its inaccessible forests. With the 1973 establishment of the 106,000-acre Great Dismal Swamp National Wildlife Refuge, management responsibility for most of the bear population was given to the U.S. Fish and Wildlife Service. Recently, the clearing of privately-owned Dismal Swamp lands for agricultural and residential purposes has eaten away at surrounding wildlife habitat. These developments have made the refuge even more important as a bear sanctuary and the need to know more about this isolated bear population critical.

In order to make sound management recommendations to safeguard the refuge for bears, the Fish and Wildlife Service funded our three-year study on bear ecology in the Dismal Swamp. Field work is nearing completion and much has already been learned about Dismal Swamp bears.

The question most frequently asked about bears in the Great Dismal Swamp is "how many are there?" Although our analysis is not complete, it would be safe to say that there are at least 250 bears inhabiting the Dismal Swamp.

And, how do these 250 bears make a living in the impenetrable muck of the Dismal Swamp? To answer this question, selected bears were fitted with collars which transmit a radio signal and by tracking them, a yearly pattern of swamp bear ecology has emerged.

◆

Spring Dismal Swamp bears emerge from their dens beginning in mid-March. Adult sows with cubs are the last to emerge, usually in late April. By this time, the youngsters are large enough (8-12 pounds) to keep up with their mothers.

From April to June, bears feed on succulent leaves and stems of such plants as greenbriar, sweetbay, and switch cane. In addition, the numerous upturned and torn-apart logs and stumps attests to their fondness for ants, termites, and other insects.

By late May, bears (males, in particular) begin to move, signalling the beginning of the mating season. Adult males, which average close to 300 pounds in the swamp, mark trees in territories occupied by receptive females. Signs of marking are commonly seen on trees where bear trails intersect the sandy roads. These traditional "bear trees," usually loblolly pines, are used year after year. Many are covered with dried, whitened sap which has dripped from the deep crevices caused by biting and clawing.

Summer As spring turns to summer, berries begin to ripen in the Dismal Swamp. Bears become highly visible at this time of year as they walk down roads looking for productive berry patches. Bears can be frequently seen high in black cherry trees, tearing off limbs and feasting on cherries. As the stifling swamp summer wears on, a whole succession of fruit appears: sweet gallberries, pokeberries, and devil's walking-stick fruit.

Not all bears remain in the swamp to sample the berry smorgasbord, however. Many venture out of the safe recesses of the refuge to feed on corn in July and August. In fact, during the study, every radio-collared male bear monitored during these months was traced in or near a cornfield at least once.

Fall Acorns are not the primary fall food source in the Dismal Swamp. Swamp bears enjoy acorns when they are available, but oaks are only abundant in a thin strip along the elevated western edge of the swamp and in a few scattered places within the swamp. Thus, bears turn to another food source, black gum fruit. Black gum trees are found throughout the Dismal Swamp, particularly in the western half of the swamp and in the Pasquotank River Basin. Until they leave their fall feeding areas on the western edge of the swamp, bears are fairly vulnerable to hunting pressure which begins October 1 on private land adjacent to the refuge.

Winter Winter is the time of denning for swamp bears. Adult females begin their winter dormancy in early December. Other bears may stay active into January and beyond, feeding in evergreen shrub pocosins on greenbriar berries and bitter gallberries. The average swamp bear dens for two and one-half months, although females with cubs may den as long as four months. Most of the "winter-active" bears that were radio tracked were young animals that probably did not store adequate fat to last the winter in a den.

The choice of den sites in the swamp is somewhat surprising, considering that many areas are inundated with water during the winter. Over half of the dens located were elaborate ground nests that looked like the work of a giant bird. Many did not have overhead protection, though some were positioned at the base of a large tree.

The remaining bears either excavated a ground den or resided in a tree cavity.

Adult sows give birth to cubs in winter dens, usually in January or February. Normal litter size for swamp bears is two, though litters of three are not uncommon. □

Eric Hellgren is working on his doctorate in fisheries and wildlife at Virginia Tech. Michael Vaughan is the assistant unit leader of the Virginia Cooperative Wildlife Research Unit at Virginia Tech.

this creature is usually quite shy and is rarely seen, even though they may live quite close to people. I assured her the mailbox and wood shed were also safe as long as she didn't store ham in either.

Similar conversations take place every year in many Game Commission offices. Most people don't know what a shy, gentle, and precious resource the black bear is.

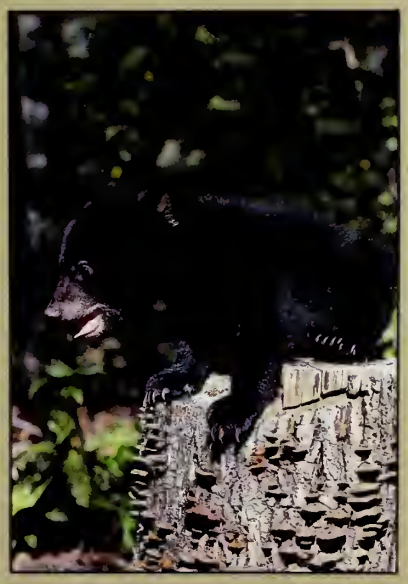
The black bear *(Ursus americanus)* is thought to have ranged over most of the North American continent and unlike its western relative, the grizzly, more readily tolerates some human intrusion. In addition, the black bear lacks the aggressive, sometimes deadly behavior of its humpback cousin. In the 17th century, many writers referenced bear and the use of meat that was often sold in markets, or the hide and claws that provide warmth and adornment for Indians.

Human encroachment and a subsequent dwindling forest resulted in the decline of buffalo, elk, mountain lion, and timber wolf, until finally in the last half of the 19th century, they disappeared completely in the East. The black bear survived, although its range was reduced to small portions of mountainous areas of the state. To this day, our eastern bear occupies only 5-10 percent of its former pre-colonial range in the Southeast.

The vast areas cleared by timber cutting were beginning to regenerate in the early 1900's. Subsequent establishment of national forests and national parks provided a place for *americanus* to escape the heavy human and habitat pressures it had tolerated. Bounties were eliminated and conservation groups pressed for protective legislation. Now most states have ongoing research programs and management projects that are designed to answer many questions about the biology and management of this gentle animal.

Although categorized as a carnivore, the feeding habits of black bears are more of an omnivore. They will eat practically anything that comes close to being palatable. However, only a small portion of their diet consists of animal matter. Their diets are usually low in fats and proteins and high in carbohydrates. Grass and mast (berries, fruit and nuts) comprise a large portion of their diets, and in the fall over 2 pounds of body weight can be gained per day.

Above: *Black bears enjoy any kind of food, and are particularly fond of hard mast, such as hickory nuts.* ***Below:*** *Bear cubs weigh only ½ pound when they are born in the den during the winter. They will stay with the sow through the year and the next winter; photos by Lynda L. Richardson.*



Bears are usually active during twilight hours, although seasonal variations in behavior are common. Individuals can be exclusively diurnal (daylight active) or nocturnal, a behavior that is usually associated with feeding. A hike in the woods can yield bear sign like bear scats, overturned logs or rocks, "mark trees," or broken limbs on trees or shrubs. Often small trails or logging roads become impassable when sassafras trees or autumn olive shrubs are pulled down during feeding.

Black bears are normally solitary except for females with cubs and during breeding season. A bear's search for food can mean it will travel great distances to store fat reserves for winter. During years of abundant food, bears tend to forage longer before returning to their summer ranges and denning areas.

Denning usually occurs between October and early January depending on weather, food availability, sex and age. Adult females usually den first and adult males last. Bears are not considered "true" hibernators. Body temperature is reduced only slightly, while a true hibernator may reduce its temperature to within 1°C of the ambient temperature. While a denning bear may periodically eat, drink, defecate and urinate, a true hibernating animal does not. A true hibernator can be handled without awakening, while the bear can be easily aroused even when attempting to quietly approach a den.

Female black bears become sexually mature as early as 2 years of age, but 3 to 5 is the norm. This maturity has been shown to be as late as 7 years old. Abundance and quality of foods can delay or stimulate both sexual response and litter size.

Breeding usually occurs in June and July with the females remaining in estrus until bred or until follicular degeneration. Ovulation is triggered with the act of breeding, but the blas-

Bear Facts From Shenandoah National Park

by Daniel Carney, Nathan Garner, & Michael Vaughan

Shenandoah National Park is home to the largest black bear population on the East Coast, and harbors one of the highest density populations in North America. The area is obviously ideal habitat for bears, but the large population of the animals has led to bear-human conflicts in and around the Park. Thus, the Virginia Cooperative Research Unit at Virginia Tech, in cooperation with the Game Commission and the U.S. Fish and Wildlife Service, has been studying the bear population in the Park in order to learn how to better manage the resource.

As part of the study, we trapped and fitted bears with radio transmitters so that we could follow the animals to learn more about their habits. As a result, we gained insight into many of the following questions that resource managers have been asking:

How many bears are there in Shenandoah National Park?

After using several methods to analyze our recapture data, our final population estimate fell between 1.7 and 2.7 bears per square mile, or roughly 500 to 800 bears in the Park at any one time. We suspect that the true number lies at the lower end of the estimate.

Where do bears spend the winter?

Most bears in Shenandoah escape harsh winter conditions by hibernating. By November their activities decrease; they become slow and lethargic. In late November or December, bears enter dens to begin their long winter sleep.

Den types include rock cavities, hollow logs, brushpiles, tunnelled-out depressions, and hollow trees. Females often den high in hollow trees previously damaged by wind or lightning. Although the average height of tree dens was almost 30 feet, one bear denned as high as 78 feet above the ground. Not all bears choose such secure dens. Some, especially males, seem to prefer a simple nest of leaves and branches in a mountain laurel thicket. During their hibernation, a bear's body temperature drops and heart rate slows. Unlike other winter hibernators, bears are easily awakened from their sleep. When we approached dens during the winter to check for cubs, we often found the occupant staring back at us from her bed.

How many cubs do bears have and when are they born?

The black bear's reproductive rate is lower than any other mammal in Virginia. Female black bears in Shenandoah usually don't breed until 3 years of age, having their first litter of cubs at age 4.

The cubs weigh less than one pound when they are born in January or February. They nurse and grow in the den until mid-April when the mother leads them out of the den. By then they weigh 7 to 10 pounds.

The average litter size in Shenandoah is two cubs. Usually the cubs travel with their mother all summer and den with her in the fall, then disperse before she breeds again the following spring. Males take no part in rearing the cubs.

What is the size of a bear's home range?

As might be expected, the amount of area used by a bear varies with sex and age. In Shenandoah National Park, young non-breeding males (less than 3½ years old) had home ranges that averaged 209 square miles. Adult male home size averaged only 75 square miles, while adult female home range size was even smaller, averaging only 15 square miles.

Why the difference in home range size? Adult females occupy only the amount of area they need to feed themselves. Adult males, on the other hand, roam during the breeding season, searching out mates.

As for young non-breeding males that are no longer under the care of a sow, home range size is a function of the availability of unoccupied range. They are chased by each adult male they encounter until they are killed, or find an unclaimed area.

What do bears eat?

Luckily, not people. As a matter of fact, bears in Shenandoah National Park eat relatively little meat. Their annual diet was 90 percent vegetation, 5 percent insects, 3 percent birds and mammals and 2 percent debris. Tree fruits, including acorns, hickory nuts, wild cherries, apples, and sweet cherries, were an important part of their diet as were all kinds of berries, mayapple and squawroot. It's likely that most of the meat in their diet is scavenged, although they surely prey on an occasional deer fawn, beaver, or woodchuck.

As local landowners can tell you, bears also like to sample their share of corn and apples. The resulting age-old conflict between man and bears is one of the problems that Park managers and Game Commission biologists are seeking to solve in studying bear habits. □

Daniel Carney and Nathan Garner recently completed their master of science degrees in fisheries and wildlife at Virginia Tech. Michael Vaughan is the assistant unit leader of the Virginia Cooperative Wildlife Research Unit at Virginia Tech.

Black bears are known to frequent abandoned apple orchards in the fall, apiaries in the spring, and cornfields in the summer. ***Above and following page:*** *photos by William S. Lea.*

tocyst (early embryo) remains unattached to the uterine wall until late November or early December.

The ½ pound cubs are born from January to March. They are hairless, sightless and helpless. Normally, two cubs are born, but three or four are not uncommon. The sow and cubs emerge from the den from March to May, and the cubs stay with their mother through the summer and fall and den with her through the second winter. The young disperse the following spring and summer. Consequently, females breed only every two years unless they lose their cubs. This low breeding potential becomes an important management consideration, particularly in areas with low populations.

Human Conflicts

A bear's feeding foray can be devastating. One bear can cause many hundreds of dollars of destruction to an apiary in one night. The failure of a farmer in or near bear habitat to daily inspect corn in the field that is entering the "milk" stage can be asking for trouble. One bear has an unbelievable appetite, and often serious crop depredation is the result of several bears feeding in one field. One particular field in Virginia of about five acres annually required 12 to 16 bears to be removed.

Although bee hives and corn damage consititute the vast majority of bear damage, a bear's quest to satisfy a growling stomach has created other headaches for bear country residents. Doors on smoke houses have failed to repel a Virginia bruin. Signs constructed of chemically treated lumber are constantly in jeopardy in bear country, as is the trash can. Coolers and convertible tops yield their contents to powerful paws and claws. One bear was an unwelcome kitchen guest in an expensive summer home in a ski resort a couple of years ago.

It has been Game Commission policy to assist people with bear problems by attempting to trap and remove them. If this is impossible, a required permit can be provided through the county game warden to the landowner to kill the bear. The Game Division's attempt to trap and relocate the bears

Outdoor Classroom

December 1986

Critter of the Month

The Mourning Dove

It never fails that some of the common, ordinary things we take for granted are also some of the most fascinating and exciting. An example of this is the mourning dove that we see so often in Virginia.

Considered a songbird in northern states, the dove is most remembered for its sorrowful "Cooo-cooo-coo-coo" call which is heard from backyards to woodlots, from the city to the mountain side. It's this plaintive call, sleek, graceful appearance and close association with humans that appeals to many people's interest in this bird.

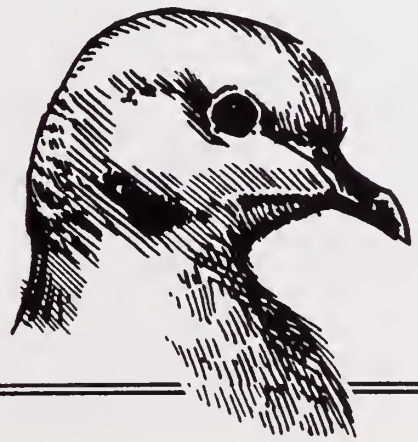
Weighing 4½ ounces at maturity, the greyish-tan bird packs a lot of zip into its fast erratic flight which contributes to its game status in the southern states. Mourning doves are strictly seed eaters. Seeds, seeds and nothing but seeds. Weeds comprise the majority of the diet, including foxtails, ragweed and millet. Cultivated plants, including corn, sunflower and wheat are also favorite foods.

One of the distinguishing traits of a dove is its manner of drinking. It sucks water up into its throat and swallows, unlike most birds that take a mouthful, tilt their head back and let the water flow down their throats.

The reproductive habits of these birds are undoubtedly one of nature's wonders. Mourning doves lay their eggs in one of the most disheveled, meager and haphazard nests you'll find in the bird world. A mere platform of a handful of twigs in the fork of a tree limb is the extent of their handiwork. One often wonders how the pair of eggs remain *on* the nest at all much less how the young survive without falling out.

But doves do not stop with one nesting. In some reports from Pennsylvannia and North Dakota, as many as six broods are raised. The eggs are incubated for two weeks, hatch and fledge in another two weeks when the female is already involved with another pair of eggs. The approach of winter weather finally puts the reproductive effort to an end.

This winter weather also serves to increase Virginia's dove population. As the extremes of cold and snow reduce the food availability of the northern birds, a southernly migration occurs. Virginia is one of the "stop-over" states that hosts thousands of the migratory doves that may continue to a more southerly state or decide to wait winter out right here. It is not a rare sight to see dozens of these sleek gray birds sitting on a telephone line in late December.—*Jeff Curtis*



Baybook: A Guide to Reducing Water Pollution at Home

Did you know that a steadily drippign faucet wastes about 20 gallons of water a day? Or that one quart of oil drained from a car engine can contaminate up to 20 million gallons of drinking water? *Baybook: A Guide to Reducing Water Pollution at Home* tells how everyday activities, from turning on a faucet to changing your car's engine oil, can contribute to water waste and pollution.

Funded by the U.S. Environmental Protection Agency, this colorful 32-page booklet was written specifically for people living near the Chesapeake Bay. But anyone who lives near a stream, river, lake, or other body of water can help reduce pollution by following the *Baybook's* guidelines.

The booklet includes clearly written chapters on how to clean up streams, landscape lawns to prevent erosion, avoid the use of harmful pesticides, and cut down on water wastes, as well as several other subjects. It also includes pollution-prevention tips for people who own cars, boats, or swimming pools. And highlighted sections entitled "What You Can Do" appear throughout the chapters to summarize tips for each problem area.

Single copies of the *Baybook* are free. Just write to the Citizens Pro-

gram for the Chesapeake Bay, Inc., Ninth Street Office Bldg. Richmond, VA. 23219. □

What's In A Log?

Beechwood fires are bright and clear
if the logs are kept a year.
Chestnut's only good, they say,
if for long it is laid away.
Birch and Fir logs burn too fast,
blaze up bright and do not last.
Elmwood burns like churchyard mold;
even the very flames are cold.
Popular gives a bitter smoke,
fills your eyes and makes you choke.
Applewood will scent your room
with an incense like perfume.
Oak and apple, if dry and old,
keep away the Winter cold.
But Ashwood wet and Ashwood dry
a king shall warm his slippers by.

These words certainly tell us something about proper wood choices. But let's examine more closely the heat equivalents of some common firewoods.

Our mixed hardwood forests offer woodstove owners a variety of woods to use. Such woods as oak and hickory, as we always hear, are the best to use. But sugar maple, American beech, and the dogwoods also produce a heat equivalent about as high as oak and hickory. These trees are sometimes less desirable because of difficulty in cutting or their small size.

Heat equivalents of various woods are something we should consider in relation to how costly it is to heat our homes by other means, such as gas, oil, or electricity.

It may come as a surprise to you, but some folks believe that firewood can compete in cost with fossil fuels. Even a cord of white pine—the wood with the lowest heating value—is said to be the equivalent in heating value to 123 gallons of oil. At the opposite end of the scale, a cord of hickory—the best wood for burning—is rated by some as equivalent to 251 gallons of oil. The efficiency of the stove or furnace, must also be considered.

Call up any firewood dealer or mingle with a woodcutter crowd and soon you'll hear words like *rick*, *cord*, *face cord* and *run*.

A standard cord of wood is a stack of four-foot logs, piled four feet high and eight feet long. This volume can also be state in cubic feet—128 cubic feet are in a cord. But nearly a third of this space is air between the logs.

The drier the wood, of course, the better the fire. Proper air movement, regardless of whether you have a woodshed or not, is of prime importance. When starting the woodpile, choose a location that is close to the door nearest the stove. You will be making many trips back and forth, some of them in miserable weather.

Why so much importance placed on dry wood? Freshly-cut wood can have an equal ratio of wood to water, and 70 percent less heating value than dry wood. Because some energy from burning must go to evaporate the moisture within such wood, less energy is available for heating. Seasoned wood produces 20 to 44 percent more heat than wet wood. The general rule is that wood should be aged for six to 12 months.

How can you tell whether or not wood is dry? Green wood is nearly twice as heavy as seasoned wood. Knock it with another log. If there is a dull thud the log is probably wet. Dry logs have a crisper ring. The edges of the freshly-cut wood still clearly shows the growth rings and even some roughness from the teeth of the saw.

Trees also vary in their value to wildlife also. For more information write, Outdoor Classroom, P.O. Box 11104, Richmond, Virginia 23230-1104. □

Building Mini-Soil Profiles

All of the different layers of a soil taken together are called a soil profile. Most soil profiles have several distinctly recognizable layers—soil scientists call these layers horizons. The top layer is called surface soil or topsoil and is known as the A horizon. The next layer is called subsoil, B horizon; and below the subsoil is the parent material, C horizon.

Materials Needed

Plastic tube approximately 1″ in diameter, 6″ long or old olive jar, crushed stone, light colored subsoil, dark colored topsoil, plastic discs approximately same size of tube/jar (optional), and wood dowel.

Directions

1. Place about 1½ inch crushed stone in bottom of tube. Shake and tamp. If available, a small plastic disc can be placed on top of the stone to prevent fine particles from the upper layers shifting down and covering up your parent material.

2. Place about 1½ inch subsoil (light in color) into the tube. Pack it

in well and drop in another round plastic disc.

3. Fill the tube to the top with a dark colored topsoil. Pack it well.

4. Without tipping your full tube, wipe clean the outside of the tube near the very top. Then carefully snap a cap or screw a top on.

Results

A miniature soil profile—your reminder that soil is much more than dirt. It's a living, natural, physical, chemical, and biological material that supports nearly all life on earth.—*Soil Conservation Service, USDA*

Litter Prevention Can Help Our Wildlife Friends

Garbage tossed beside the road and bottles lying filthy and broken in a park are ugly reminders of the carelessness of some Americans. Litter is unsightly and it is dangerous to people and to animals. Wildlife, farm animals and pets are abused by a constant bombardment of trash. Fish swallow shiny objects drifting down through the water—sometimes, they become trapped by debris. Water birds can starve if their necks become caught in plastic beverage can loops. Mockingbirds have been known to accidentally suffocate their young when they use long plastic strips in their nest construction. Mammals can be cut by broken glass, and may get their heads or feet caught in beverage and food cans.

Teachers can raise the "Litter Consciousness" of their students and help prevent these tragedies. The following activities may be useful:

1. Show the student how to cut the plastic loops of beverage can loop carriers to prevent injury to animals.

2. Using pictures of pets and wild animal friends (or real live creatures), elicit discussion of how much happier animals would be without litter in their lives.

3. Demonstrate ways to dispose of trash at home to prevent spillage by animals. Trash cans can be hooked to the garage wall or placed inside simple fences. Lids should always be put on tightly.

4. Emphasize the importance of "packing out" what is "packed in" when hiking.

5. Help your class organize some positive activites to help wildlife, such as building bird feeders, planting vegetation for wildlife to hide in and/or feed on, or practicing wildlife photography. See Operation Waste Watch in your school library.

Encouraging positive experiences with wildlife will lead the children towards a greater concern for the welfare of our wild animal friends.—*Jan Robertson, Virginia Division of Litter Control, 1215 Washington Bldg., Capitol Square, Richmond, VA 23219.*

Note: A related activity for Project WILD teachers is "Litter We Know" found on page 51 in the Elementary Guide.

Mourning Dove

Color the wings and tail slate grey.
The rest of the body is tan with a little
purple on the neck.

illustration by Phyllis Saroff

to remote areas where there is less opportunity to get into trouble does require considerable equipment, manpower and effort. Several hundred bears have been translocated since the trapping program was initiated.

During the peak trapping periods of May, June, August, and September, Biologist Assistant Gerald Blank, Jr. can be found trapping on as many as 10 or more locations statewide with more than three times that many traps and snares. The number of bear trapped and relocated can range from 25 to 75 per year.

The aluminum culvert-type trap has evolved from years of design and material changes, as has the vehicle used to work with the bear and trap. Winches have been indispensable in pulling a 400- to 500-pound bear in a metal trap from a difficult set location.

Once the bear has been caught, he is drugged to allow biologists the opportunity to gather information and apply ear tags. A metal ear tag is put in both ears that has a number, a request to return it to the Game Commission, and a $50 reward per animal for this cooperation. A few very old animals may still be wearing $25 reward tags that were installed during the early 1970's. An orange, round, plastic ear tag is installed in the ears of female bears. This identification offers the hunter the choice of not harvesting a female.

While drugged, a small tooth just behind the large upper canine is removed for aging. This process requires decalcification of the tooth, making very thin slices and mounting and staining them on microscope slides. The layers of cell deposition are counted much like the rings in a tree. The technique does take considerable experience to master but it is the only accurate way to age wild bears.

Blood samples are taken to test for several disease antibodies and blood parasites. Currently there is no method of determining if females are pregnant, however, blood sample work being initiated soon at Virginia Polytechnic Institute and State University may provide this tool.

After completing the process of col-

lecting data and samples, the bear is put back into the culvert trap, given a dose of antibiotics if any abrasion or infections are detected, then injected with another drug into the femoral artery to counteract the effects of the first drug. The bear is usually up and fully alert in one to two minutes.

Several release sites have been chosen that minimize the opportunity for these bear to get into trouble again. They are usually remote mountainous areas away from people and agricultural crops.

Hunting

There are three categories of hunters that account for practically all of the legally harvested bear in Virginia. The first is the bow hunter. Bow hunting for bears requires the purchase of a special archery license in addition to a regular hunting license and a big game license. The bow hunter killed 7.2 percent of the 472 bears taken in 1985.

The regular bear season opens on the fourth Monday in November. This allows hunters who are primarily hunting deer the opportunity of killing a bear. Most of these bear are shot with high-powered rifles and accounted for about 22 percent of the total harvest in 1985.

From December 1 through January 5 this year, the bear hunter with dogs will be able to hunt. This season exists only in those counties in which the Commission has the authority to set the hunting season. In 10 counties in southwest Virginia, plus one county and two cities in the southeastern part of the state, the legislature many years ago set the seasons that begin as early as October 1 each year. The dog hunter accounted for about 70 percent of the bears harvested in 1985.

The dog hunter can be considered the most efficient of the three types of bear hunters. By incorporating multiple packs of dogs, four-wheel drive vehicles with citizens band radios, and the newly available dog collar transmitters with hand-held receivers, the modern bear dog hunters appear to have increased their chances of success.

The last bear hunting season change was made by the Game Commission in 1974 (excluding the legislatively set seasons). Many counties, mostly in

Black bears are hunted primarily with dogs in the state, although bow hunters killed 7 percent of the 472 bears taken in 1985. ***Top:*** *photo by Lynda L. Richardson.* ***Bottom:*** *photo by Nell Bolen.*

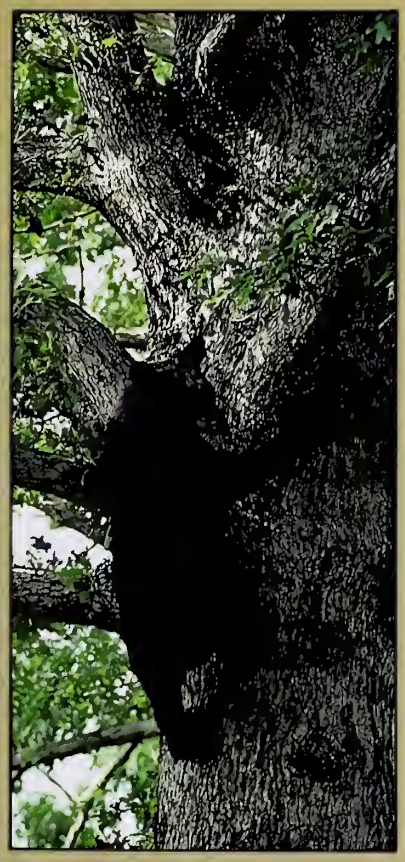
Piedmont and Tidewater, were closed to bear hunting, plus the first two weeks of bear hunting were eliminated.

Following this season change, the bear harvest ceased its extreme fluctuations until 1981, when it doubled the 1974-1980 average of 216. Since that time it has averaged 414. A partial explanation for this increase is probably due to the 1974 season change. It has been known that female bears usually den before the males do and later seasons encourage higher percentages of males in the harvest. Consequently, with more females in breeding age classes, it is logical more reproduction should be realized.

Reproduction estimates, however, are difficult to obtain. Bear hunters are requested to remove and submit the small tooth described above for aging when they check their bears in. Envelopes with instructions are available at the check stations. However, tooth submissions by Virginia hunters have been low. While in other states submission rates are 60 percent to over 90 percent, here in Virginia tooth submissions average around 15-20 percent. Teeth from harvested bears are vital for obtaining accurate information on cub production as well as measuring the percentage of adult versus young animals in the population. Hopefully, the new "Virginia Cooperating Black Bear Hunter" arm patch sent to each hunter making a submission will increase our data base.

Management

Virginia finds itself in a transition zone between states to the north with high populations of black bear, and southern states with very low populations. Yet, within our borders exist possibly the highest documented concentration outside of Alaska. The Shenandoah National Park population has recently been estimated as high as one bear/km^2 (2.8 bear/mi^2). The number of bears, however, fluctuates, and the actual population on the Park possibly is less than this density. These population levels offer very good opportunities for the study of behavior, reproduction, survivial rates, home and breeding ranges and other population parameters.



Black bears are agile tree climbers, unlike their humpbacked cousin, the grizzly bear. They primarily climb trees to escape from danger and to locate good denning sites; photo by William S. Lea.

Because 1.5 million acres in the two National Forests are managed under the multiple resource concept and under a formal cooperative agreement with the Virginia Commission of Game and Inland Fisheries, the bear is apparently stable or perhaps increasing in numbers in some of its range. However, some large tracts of National Forest appear to have very low populations, with little signs of improving due in part to very early and lengthy hunting seasons dictated by the legislatively set seasons.

With changes in timber harvesting and road management policies, great strides have been made in the last two decades in improving not only bear habitat, but the habitat of many resident wildlife species. Bears benefit from clearcuts averaging 20-30 acres on National Forests and new guidelines offer techniques for increasing the amount of edge, providing safety zones for streams, and giving special consideration to key areas such as springs, seeps and grape thickets.

Road management is probably the single most important tool available to biologists in managing bears. The congressionally mandated U.S. Forest Service Land Management Plan has been years in the making and the final draft has now been released. Standards and guidelines dictate a minimum of one mile of open road per 4,000 acres in the 28 percent of the forest where the bear is the featured species on the George Washington National Forest. Some evidence is available suggesting some bears avoid roads of any type, yet other bears readily use and cross closed roads. Biologists generally agree that open roads, especially those that are frequently traveled, may be harmful to bear populations. Although the number, placement, type and density of road construction are important concerns of the wildlife manager, manipulating the use of roads is the key to improving bear numbers in those areas.

History and research have shown that bear populations thrive only when human interaction is minimized. This is exemplified in Virginia in the three habitats with the healthiest populations. Both the Shenandoah National Park and the Great Dismal Swamp National Wildlife Refuge offer severely limited access and large tracts of real estate undeveloped by man. A group of very remote U.S. Forest Service properties primarily in Augusta and Rockingham also offer this remoteness—although it continues to be more difficult to salvage this relatively unrecognized resource. These areas offer good bear habitat not just because they offer food, water, cover, and den sites, but because there bears can enjoy a little peace and quiet. □

Dennis Martin is a Game Commission wildlife research biologist and Gerald Blank is a biologist assistant for the Game Commission.

Night Gliders

◆

Virginia's night gliders are flying squirrels, and one of the two species historically found in Virginia is living up to its elusive reputation.

by Mike Fies

The Indians called him "Assapanick." Seldom seen by human eyes, this elusive beast came out only at night. At dusk, it leaped from its hiding place, searching for food with its large and lustrous black eyes. At daybreak, it returned to its resting place, secluded in total darkness until the next night arrived. The Indians have long since disappeared from Virginia's woodlands, but this elusive creature of the night is still among us. Today, we know him as the flying squirrel.

The smallest of the squirrels in Virginia, no creature could look more harmless. With its large black eyes, short upturned nose, and soft silky fur, the flying squirrel looks a lot like a cute stuffed animal that you might win at a carnival. Don't let their innocent looks fool you, however, because they possess a nasty set of teeth that they don't hesitate to use when threatened. Flying squirrels can also be annoying, especially when they nest in attics and chew on electrical wires.

Despite their shortcomings, flying squirrels are impressive animals. They are one of the few mammals capable of "flight." By strict definition, however, flying squirrels don't really fly. They are actually very proficient gliders. They have broad flaps of skin that extend from the wrists of their front legs to the ankles of their rear legs. When their legs are outstretched, this extra skin forms a sort of parachute that allows the squirrels to glide from tree to tree. Aerial maneuverability is achieved by adjusting the "slack" in their parachute. Their flat tail serves as a good rudder. Landings are performed by turning upwards suddenly and then grasping the bark of a tree with their sharp claws. Flying squirrels are easily capable of gliding 30 to 40 yards.

Few people realize that there are two species of flying squrrels in Virginia, the southern flying squirrel *(Glaucomys volans)* and the northern flying squirrel *(Glaucomys sabrinus)*. The northern flying squirrel, however, is very rare and is found in only a few areas of the mountains. In fact, the northern flying squirrel is so rare that the U.S. Fish and Wildlife Service has declared the species as endangered in Virginia, West Virginia, North Carolina, and Tennessee.

Southern flying squirrel, Glaucomys volans; *photo by Karl Maslowski.*

Rarely seen because they come out only at night, flying squirrels are active at all times of the year. Like other squirrels, they store food for the winter. Hoarding behavior is at a peak in November. They are primarily seed eaters, but they also eat a variety of buds, fungi, insects, and even some small mammals. In captivity, they have even been known to consume each other.

In the wild, flying squirrels are communal in nature, usually nesting together in groups of two or three animals. Preferred nest sites are in tree cavities with entrance holes about two inches wide. Old woodpecker holes are often used. Nests usually consist of shredded bark, moss, grass, or leaves and are usually eight to 10 inches deep. During the winter, flying squirrels tend to congregate in large groups, an adaptation that may help them stay warm. As many as 26 flying squirrels have been found in a single nest during cold weather.

Comparatively clumsy on the ground, flying squirrels are reluctant to leave the safety of the trees. By venturing into the open, a flying squirrel increases the risk of becoming food for a variety of predators, including owls, snakes, weasels and mink. Flights over open water could also be disastrous, since many people believe that flying squirrels can't swim. This may be untrue, however, since flying squirrels often show up in wood duck boxes that have been erected over water. In fact, Bob Glasgow, a wildlife biologist for the U.S. Forest Service, recently observed a flying squirrel doing a rather impressive butterfly stroke in a lake in Bath County.

Although similar in appearance to the southern flying squirrel, the northern flying squirrel can easily be distinguished from its close cousin. Most noticeably, northern flying squirrels are about 1½ times larger than the southern flying squirrel. The southern

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The southern flying squirrel (Glaucomys volans) *is common in the state, but the northern flying squirrel* (Glaucomys sabrinus) *prefers to live in spruce forests at high elevations, and biologists are having a hard time locating this rare animal in the state. Above: Southern flying squirrel; photo by Charles W. Schwartz.*

is only about the size of a chipmunk, while the northern is almost as large as a red squirrel. Another feature used to distinguish these two species is the color of the fur on the squirrel's belly. On the northern flying squirrel, these hairs are slate grey at the base and white towards the tip. The belly hairs of the southern flying squirrel are pure white.

Northern flying squirrels also seem to differ in the habitat they prefer. Although both species sometimes live in the same areas, northerns appear to be partial to spruce forests, especially at elevations higher than 3,500 feet. Unfortunately, there isn't much of this type of habitat in Virginia. Food habits of the two species also differ. The northern flying squirrel is less of a seed eater, and depends more heavily on lichens and fungi.

In recent years, northern flying squirrels have been found at only two locations in the state. These extremely rare animals have been collected near Mount Rogers in Grayson County and on the George Washington National Forest in Highland County.

The northern flying squirrel was not always rare in Virginia. In fact, this species was probably widely distributed across the state during the Ice Age. Fossil deposits at Natural Chimneys in Augusta County show that this "relict" of the Ice Age has been a resident of Virginia for at least 18,000 years. At the end of the Pleistocene Era, however, the glaciers began to retreat and the northern flying squirrel was forced to move into isolated areas at high elevations where climatic conditions were still favorable. As a result, the northern's distribution became increasingly fragmented and occupied zones became separated by large expanses of unsuitable habitat. Eventually there were only a few "pockets" of suitable habitat left.

Although populations of the northern flying squirrel were probably declining before the arrival of European settlers, most researchers believe that human disturbance has accelerated this decline. In the past 200 years, most of Virginia's forest have been cut. The spruce forests have not grown back, and most of the cleared areas regenerated into hardwood forests unsuitable for the northern squirrel.

The disappearance of spruce forests has also paved the way for an "invasion" of southern flying squirrels into areas that were previously occupied only by northerns. Scientists believe that when the ranges of the two species overlap, the southern flying squirrel is able to outcompete the northern squirrel for available nest sites. Studies on captive animals have shown that the southern flying squirrel is more aggressive and more territorial than the northern flying squirrel. When confrontation over nest sites occur, the northern is forced to settle for the less desirable areas. Biologists refer to this phenomenon as "competitive exclusion." As a result of this competition, the breeding potential of the northern flying squirrel is reduced.

"Whatever the reason for its population decline, the northern flying squirrel is in trouble in Virginia."

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In addition to direct competition, there is also some evidence to suggest that the southern flying squirrel employs a biological weapon to help eliminate the northern species from certain areas. Studies in North Carolina have shown that the southern squirrel carries and transmits a nematode (small worm) parasite called *Strongyloides* that is lethal to the northern squirrel. Apparently, the southern squirrel is a natural host for this organism and can carry it unharmed. When the range of the southern flying squirrel expanded, interchange between the two species of squirrels became more frequent. As a result, the northern flying squirrel, which lacks immunity to *Strongyloides*, became increasingly likely to develop lethal infestations of the parasite.

Whatever the reasons for this population decline, the northern flying squirrel is in trouble in Virginia. In an effort to protect this species and its critical habitat, the Virginia Game Commission has initiated a study to determine where this animal resides in the Commonwealth. In conjunction with the U. S. Forest Service and Virginia Commonwealth Unversity, 300 nest boxes have been built and installed in mountainous areas in the western portion of the state. Biologists are monitoring these boxes once every two months, in hopes of finding northern flying squirrels living in some of them.

Boxes are checked during the day when the squirrels are inactive, by obstructing the entrance holes and opening a hinged front door. If the box contains squirrels, they are removed from the tree, and the sex, age, and weight of the animals is recorded. A numbered ear tag is then attached to each squirrel for individual indentification.

Although the study has just recently begun, 131 *southern* flying squirrels have already been trapped in the boxes. Unfortunately, no northern flying squirrels have been captured. Despite this lack of success, biologists are optimistic that they will eventually find the northern variety in some of these areas, since the nest boxes have only been up for a short period of time, and many have been checked only once. Nest boxes will be monitored for at least two years. Other types of live traps will also be used in an attempt to capture these animals.

One might ask why the Game Commission is expending so much effort trying to protect this species in Virginia. The most important reason is to maintain species diversity. The northern flying squirrel is a native resident of the state and the Game Commission has the responsibility for maintaining their populations. By determining where the northern flying squirrel resides in Virginia, the Game Commission can begin protecting this rare and elusive animal. □

Mike Fies is a wildlife biologist with the Game Commission.

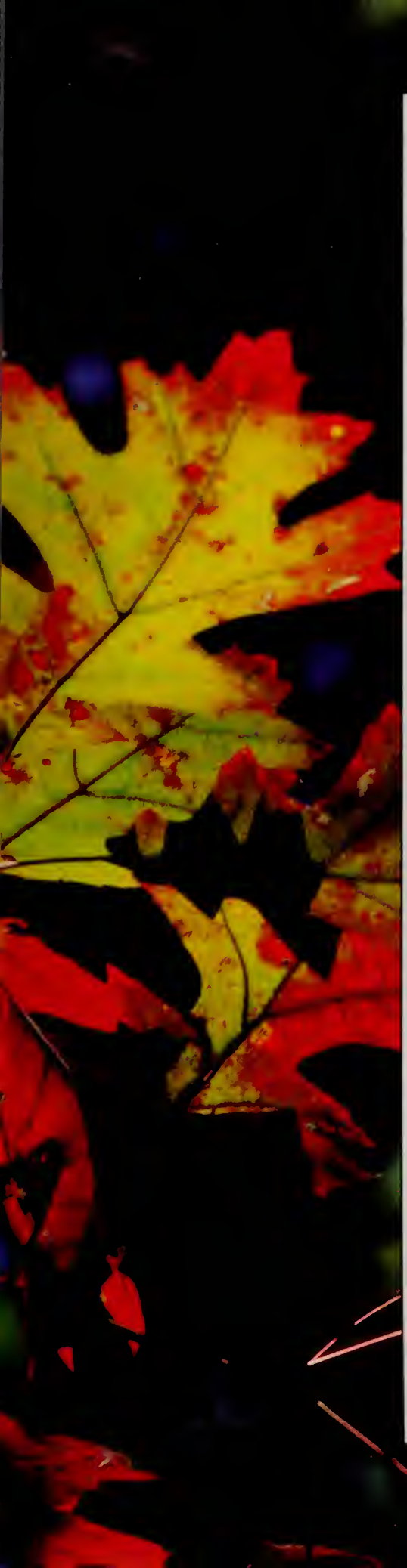

photo by John W. Warden

Acorns In High Places

Mountain oaks in Virginia provide vital winter food for wildlife.

by Rick Preve

Bear oak; photo by Jack Randolph

I am sitting by a large tree in the early morning valley, wiggling my toes in my boots to keep my feet from going numb. This is what I dislike about late season deer hunting: it is so cold that no matter how well you have planned where to hunt, you start asking yourself if you are in the right place only five minutes after sitting down. A freezing December morning in the mountains of Virginia is a true test of patience. I try to remember a German hunting proverb my father once told me: "You can kill a lot more deer with your seat than with your legs."

Sitting still in the woods gives me time to think about what else is hiding behind the sticky grey fog: a barred owl returning from the night's hunt, a raccoon still busy by the water of the stream, the mice asleep under a blanket of crackly leaves and patchy frozen snow, and the trees themselves. As a forester, I spend a lot of time with trees: I measure them, count them, I

What to do if you come face to face with an oak tree in the woods of western Virginia.

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1. Don't panic.

2. Slowly circle uphill around the tree. This is unlikely to trigger a move on its part and will allow you to inspect its leaves more easily.

3. Very slowly, and while keeping an eye on the oak, reach for your field tree-identification book in your back pocket.

4. Assuming that you are not trembling too much and you have found the oak *(Quercus)* genus in your book, size up your opponent. If you are looking at a tree at least 15 feet tall that clearly has one main trunk and is not a shrub, you can eliminate bear oak *(Quercus ilicifolia)*. Bear oak is a bush-like tree that grows in clearcuts, along roadsides, and under powerlines or in other disturbed sites, particularly on rocky or dry slopes.

5. If this is a "real" tree (you know, the kind they made you draw in the second grade with a straight trunk and a puff of green leaves on top) take a look at its leaves: oaks with leaves that have smooth margins are in the white oak subgenus and include the white and chestnut oak. Oaks in the red oak subgenus are the northern red oak, scarlet oak, and black oak and have leaves with bristle-tipped lobes that are often covered with fine hairs.

6. If the leaf margins are smooth you only have to decide between white oak *(Quercus alba)* and chestnut oak *(Quercus prinus)*. Look them up in your field guide. Their leaves are quite different. And notice how their barks differ too: the white oak is smooth, the chestnut oak has a bark that is furrowed with edge-shaped ridges. Where the tree is growing is also important, since white oak is more likely to be found in moist coves than the chestnut oak, which is prevalent on the higher ridges or rockier ground.

7. If each lobe in your oak's leaves has a bristle at the tip, you are looking at a tree in the red oak subgenus. Time to turn into a forestal Sherlock Holmes and dig around for further evidence. Look on the ground or on the branches for acorns and compare them to the illustrations in your field guide: the northern red oak *(Quercus rubra)* has a big acorn sitting in a flat cup that looks like a triple-scoop ice cream in a shallow saucer. The acorns of scarlet oak *(Quercus coccinea)* and black oak *(Quercus velutina)* sit in much deeper cups. The bark is also a good way to tell these species apart: northern red and scarlet oak have a light grey bark with silver streaks, while the bark of black oak is of a somber, dark-grey steel color. One more tip: the inner bark of these oaks looks and tastes quite differently. The northern red oak and scarlet oak have a pink or whitish inner bark that tastes just like regular wood (sort of like your cereal does). The black oak has yellow to orange inner bark that will pucker-in your face for about two weeks after you taste it.

8. Still confused? You may want to take a branch with some leaves to a dendrologist. Dendrologists are usually not listed in the yellow pages, but can be found instead in tiny corner offices of forestry schools buried under mountains of botany books and dried leaf specimens. They will give you good advice, so keep it handy. Where? Inside the tree book in your back pocket, of course.—*R.P.*

tell people how to care for them. And yes, I cut many of them down. But, I also plant many of them in the spring. I must confess a certain preference towards black cherry. I like the reddish brown wood, the black bark. And black walnut too: rich wood, the color of chocolate cake.

But this time of the year, it has to be the oaks. There is something timeless about the oaks that blends in well with hunting. When some of the oaks in these woods first grew their leaves, mountain lions and elk were at home in the forest. Earlier this fall I gathered some acorns, and after boiling and pressing the meat, I used the extract as a masking scent. I do not really know how well it works, but I like to think that it makes me invisible even to the wariest buck.

Oaks in the fall mean food ("hard mast" in the biologists' lexicon) for wildlife. The acorns that litter the forest floor are a Thanksgiving feast. But, many animals and birds don't wait until the acorns fall before helping themselves. A study of oaks growing in the southern Appalachians showed that 44% of the acorn crop was eaten by squirrels and birds while it was still on the branches. The list of wildlife species that benefit from acorns is long and diverse: from microscopic insects that bore into them to the mighty black bear sow fattening up for the winter. In between is a whole wildlife community, from chipmunks and mice, to wood ducks and blue jays.

And acorns are what keep game from going into the winter weakened by an empty stomach. The association between good acorn crops and fat deer or wild turkey is known even to the most casual hunter. A fall squirrel hunt far from an oak woodlot is not likely to be too successful. Turkey scratchings amongst the leaves speak of the bird's quest for acorns and alert the hunter to look for a feeding gobbler. White oak acorns may have a sweeter taste than those from red oak, but they all feed game. And, as it so often happens in nature, where we find that many things are interrelated, the oaks depend on game for their survival as well. Squirrels have been shown to be the primary vehicle for acorn dispersal, and thus

the eventual regeneration of oak forests.

Here in Virginia, we have oak forests throughout the state. There are species of oak that grow on the coastal plain with which I am barely acquainted: laurel oak, cherry-bark oak, and others. As a resident of Albemarle County, I know the oaks of our western mountains better: white, chestnut, northern red, scarlet, and black oak. I have seen the scrubby bear oak growing in the high mountains and other less common species such as post, southern red, and chinkapin oak. From the eastern boundary of the Blue Ridge to the western edge of Virginia across the Appalachians, oaks are the source of food and shelter to our wildlife.

The acorns that I now see half-frozen in the mud began forming in April or May. At that time those oaks of flowering age (from 20 years up) began to produce small, single greenish female flowers and yellowish catkins of male flowers. It is ironic that such an important event in the life of our woods should go on with such little fanfare: no flashy white petals of dogwoods, no pink blazings of azaleas. The oaks go about their business quietly. But when fall comes and the acorns ripen, both hunters and wildlife take notice. Chestnut oak is among the earliest to dot the forest floor with its fruit. But by this time of the year, other species have followed suit.

Not all years are equally good for acorn production. Depending on the specific oak species and where it is growing, a good crop may come almost every year or once in seven. Most of our oaks in the mountains of Virginia seem to do well on a three to four year cycle, and a little spring scouting for oak flowers can give you an idea of the acorn crop potential for next fall.

Oaks grow throughout the mountains of western Virginia, but can be particular as to where they like to sink their roots. Across the valley from where I sit, for example, I can see the southern and northern slopes of many small ridges. On the drier, warmer southern slopes, I can make out the deep green of pitch pine forests through the morning haze. It is on the cooler, moister, northern slopes that you are more likely to find the oaks. Look for

this the next time you are gazing at a winter mountain view: the dark green of the pines on the southern and western slopes, the brown or grey of the oaks and other hardwoods on the northern or eastern sides. Not that the pines wouldn't like to grow there, too, they just can't compete against the oaks for the better ground. They may be able to hold their own for awhile (for example, for the first 30 years after invading an abandoned pasture), but soon the oaks and other hardwoods which are better able to grow in the shade, will crowd them out.

But, while oaks will outcompete the pines, they also do some fighting amongst themselves. If you ever find the "typical" Virginia forest (where everything is organized by the book and each tree is growing where foresters think it should), you will see that the best soils, at the toe of the slope, are occupied by white and northern red oak. (A fortunate coincidence for the early settlers and loggers, as these species are also much prized for their lumber.) Here, these two species of oak grow with other moisture-demanding trees such as yellow-poplar, white ash, or black walnut. Further up the slope, as the soil becomes rockier and drier, black oak may become the most important species. And on the mountain top you are likely to find a mixed forest of scarlet and chestnut oaks. In reality, this neatly arranged succession is much more varied. I have seen chestnut oaks growing by the waters of a lake or huge northern red oaks towering on mountain tops. But, what is important is that oak species, through both their diversity and widespread presence, are an important nexus in the web of forests and wildlife.

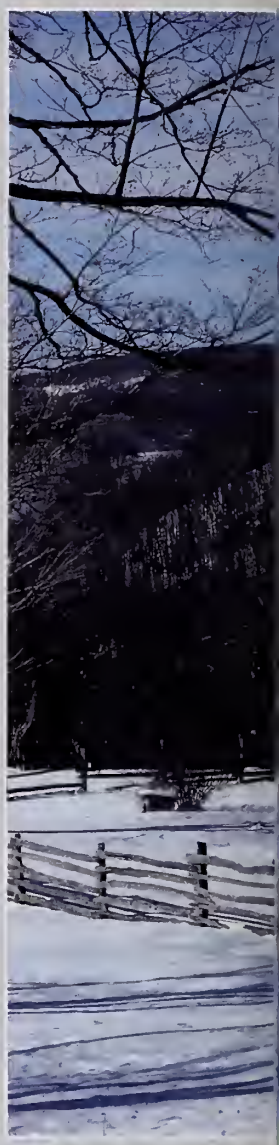
The morning light now shines brightly on my face, the weak winter sun as high as it will climb for the day. My eyes are red with sleep and my hips ache with stiffness. I slowly get up and walk downhill to the road and the farm below. I did not see a deer this morning. But as I walk, underneath my boots, the crunch of acorns beckons me back to a thousand other morning hunts in the oak woods. □

Rick Preve is the president of National Resources Consultants, Inc. in Charlottesville.

Showing Their Age— And Proud Of It

Virginia's State Parks system is 50 years old this year. They've come a long way.

by Bob Gooch



Grayson Highlands State Park; photo courtesy of the Department of Parks and Recreation.

In 1936, hunger marchers were moving on Washington demanding a better break from their government, and across the Atlantic there was a hot revolution being waged in Spain, one Virginians heard about sporadically and then promptly forgot. Of more concern to a few serious citizens were the war clouds gathering over Adolph Hitler's Germany.

"That could mean trouble," some warned.

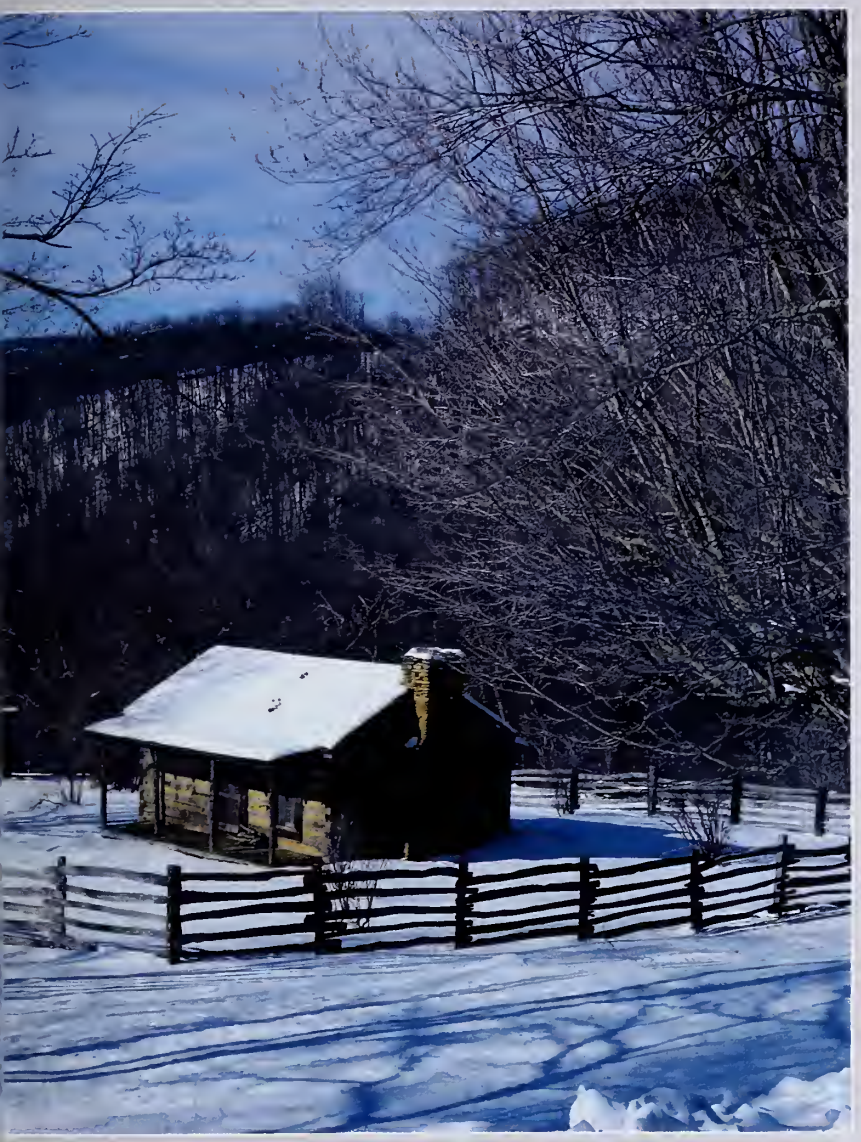
But most tossed that aside also and turned their attentions to their own economic and financial problems.

Ninteen hundred and thirty-six was also an election year and President Franklin D. Roosevelt, promising to bring America out of the despair and gloom of the depression, was swept back into office for the second of what would stretch eventually into an unprecedented three plus terms in office.

Despair, economic depression, high unemployment, war worries, and an uncertain and seemingly bleak future. This was the climate into which Virginia's state parks system was born with the opening of the original six parks on June 15, 1936—just in time for those who could afford a vacation. A vacation was something few ever considered during those bleak years. Still, the new parks offered a cheap opportunity for those who could spare the time and a few scarce dollars.

The six parks that opened their gates that distant June day were Douthat in Allegheny and Bath Counties, Fairystone in Henry and Patrick, Hungry Mother in Smyth, Seashore on the Chesapeake Bay in what was then Princess Anne County, Staunton River in Halifax, and Westmoreland on the Potomac River in Westmoreland County. Scattered across the state, they offered a rich variety of vacation possibilities for depression-plagued Virginians. Options ranged from the broad beaches of the Chesapeake Bay to the rugged Allegheny Mountains and from the historic Potomac River to the eastern slopes of the Blue Ridge Mountains. The prime movers in the park movement didn't know it then, but Staunton River State Park would eventually rest on the shores of Buggs Island Lake, the largest inland body of water in the state, and the waters of Philpott Lake would one day lap against the boundaries of Fairystone State Park.

The seed for those original parks had been planted a decade earlier with the formation of the Virginia Commission on Conservation and Development. The Commission's early efforts were directed toward acquiring land for the Shenandoah National Park, and it was not until 1929 that serious thought was given to the development of a system of state parks. In December of that year, the Garden Club of Virginia, the Izaak Walton League, and the Virginia Academy of Science gathered in Richmond and adopted a resolution calling for such a system. The resolution was presented to Governor-elect John Garland Pollard, and the result was a comprehensive study of various state park systems. The Commission came up with an excellent plan, but no funds were available to implement it. The economic crash of 1929 had turned a booming economy into one of almost unprecedented depression. Both private and public funds were



limited and difficult to obtain.

President Roosevelt's war on the depression, however, brought a glimmer of hope. In 1933, he formed the Civilian Conservation Corps to provide bed, board, and jobs for two million young Americans. This move brought cheap labor to Virginia. Civilian Conservation Camps were set up at the sites of the original six proposed parks. The "CCC boys," as they were called, went to work building bathhouses, cabins, dams, picnic areas, roads, trails and other park facilities, and the state parks as we know them today began to take shape. Those young men did good work, and many of the facilities in use today stand as monuments to their dedication, and symbols of the Great Depression.

Six state parks and four day-use recreation areas made up the parks system during those trying prewar years, and they served the state well. Probably at no other time in their history were they so vital to the well-being of the people of the Commonwealth.

The postwar years brought Pocahontas State Park in 1946. Formerly the Swift Creek Recreational Demonstration Area in Chesterfield County, it was acquired from the National Park Service and included in the state parks system. And in 1949 the Prince Edward Recreational Area became a full-fledged state park.

Despite an ever-growing postwar demand for camping and other outdoor recreation, the Division of Parks did not make great strides during the 1950s. With financial help from the Southwest Virginia cities of Pulaski and Radford, however, Claytor Lake State Park became a reality.

Any time lost during the 1950s was recaptured during the turbulent 1960s. The creation of a Natural Areas System brought into the fold False Cape State Park, the Charles C. Steirly Heron Rookery, Goshen Pass, Lick Creek and the Bone Island, Parkers Marsh, Seashore, Caledon and Wreck Island Natural Areas.

While primitive camping is permitted in False Cape and a visitor center and hiking trails will be developed at Caledon Natural Area, generally these areas are preserved so the citizens of Virginia can enjoy examples of their state's natural land types in an unspoiled setting.

The 1966 General Assembly recognized the mushrooming demand for outdoor recreation in a plan that eventually saw the acquisition of a number of new parks. Chippokes Planatation in Surry County, Grayson Highlands in Grayson, Natural Tunnel in Scott, and Occonneechee in Mecklenburg County on the shores of Buggs Island Lake came into the system. Later came Lake Anna, Mason Neck, Sky Meadows, Smith Mountain, and York River State Parks.

Despite the changes in the original concept, spawned during the Roaring '20s and nurtured 50 years ago in the gloom of the Great Depression, the state parks system has remained much the same, serving the people of Virginia, protecting their natural heritage, and opening gates to the outdoors in the Old Dominion. □

Bob Gooch is a newspaper columnist and contributor to many outdoor magazines.

From the Backcountry

Black Bear Hunters: We Need Your Help!

Tooth Needed

Answers to some questions biologists must ask are often impossible or at least difficult to obtain. The professional staff of the Game Division must make season recommendations to the 10-member Commission every other year and must attempt to answer a myriad of these questions involving data and statistical interpretations with a healthy mix of public input and wildlife management principles. The biologist often need the help of the hunter in answering these questions.

Black bear data is particularly difficult to obtain. Males are difficult to distinguish from females. Both are in relatively low numbers and are quite shy by nature. Aging and identifying the sex of wildlife species is a fundamental tool in managing practically all game animals, but aging black bear can come only by removing a small tooth behind the large canine tooth in the upper jaw. This tooth is decalcified, cut longitudinally, stained and put on microscope slides. The annual deposit of enamel cells can be counted, much like the rings of a tree stump, to give the age of the bear—a fine technique for both living and harvested animals.

These bear teeth have been requested of hunters since 1972 to help give biologists a better picture of the age structure, reproductive success, sex ratios and harvest distribution of black bear in Virginia. We encourage hunters to supply us with this valuable information, and in appreciation for their help, we have designed an arm patch, which will be awarded to each hunter supplying the tooth and some fundamental data about the kill.

Envelopes, specially designed with instructions and illustrations, are presently at check stations in counties with a bear season. You can also obtain one by contacting your local game warden, or writing to Dennis Martin, c/o Virginia Game Commission, Route 6, Box 484-A, Staunton, Virginia 24401.

Remember, your support in this program is vital. Other than our limited trapping and collection of road or illegally killed bears, we have no other access to the kind of information we need to determine the health of the bear population in the state. The kind of information that you, the bear hunter, can provide, is *essential* to the future of bears in Virginia. □

Pass Up Females

The Virginia Commission of Game and Inland Fisheries biologists are now installing a new ear tag in the ears of female black bears. The orange tag will give hunters the option of not harvesting a female bear when seen in the woods or at bay with hounds. There are, however, many females that have been tagged prior to this past summer that are wearing the conventional metal ear tags only. In addition, hunters near the Shenandoah National Park may see ear tags with other colors. These should not be confused with the orange tags.

Although this project has been considered for serveral years, requests by interested bear hunting groups has encouraged its implementation. We are eager to hear from hunters about this and other projects designed to improve the quality of hunting in Virginia. For more information, contact Dennis Martin, Virginia Game Commission, Rt. 6, Box 484-A, Staunton, VA 24401 or call 703/885-9030. □

Photo Credit

We neglected to credit two fine photographers for their work in the October issue of the magazine. The Brittany on the run on page 17 was taken by Tim Wright. The Brittanies and their friends on pages 20-21 were taken by Lynda Richardson. □

Winter Projects For Wildlife

The Game Commission has recently produced a "how-to" publication with funds from the Nongame and Endangered Species Program entitled "Wildlife Plantings, Boxes and Platforms." Learn how to build martin houses, bat houses, osprey platforms and feeding stations. Also included is a list of trees that provide food and cover for wildlife. The publication is available free by writing: Virginia Game Commission, Education Division, P.O. Box 11104, Richmond, VA 23230-1104. □

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V·I·R·G·I·N·I·A'·S

The White-footed Mouse

by John F. Pagels
photo by Gregory K. Scott

W·I·L·D·L·I·F·E

". . . And all through the the house, not a creature was stirring, not even a mouse." Probably most everybody has had a mouse stir in their house at some time or another. I think back to my boyhood days on the farm in Michigan and the very short trapline that my mom ran—under the kitchen sink. We knew that there were at least two kinds of mice in the world; the ole house mouse and another, the occasional visitor that we called the pretty one. Years later in college I learned that the pretty one was one of the more than 50 species in the genus *Peromyscus*.

Described by eminent mammalogist, the late E. Raymond Hall, as a "clean and dainty" mouse, the white-footed mouse, *Peromyscus leucopus*, is one of three species of *Peromyscus* that occurs in Virginia. Too, the deer mouse and cotton mouse have somewhat limited distributions, but no matter where you are, from the beach to the mountains, if you see or hear a mouse, chances are good that it's a white-footed mouse.

Although the house mouse has domain of the central city and buildings, the white-footed mouse is found in city parks and all of the countryside. Its numbers are greatest in woodland habitats, and those with significant amounts of shrub and vine growth—sites where its climbing adaptations create many favorable options. Using its tail for balance and its sharp claws to lock into any irregularities in the climbing surface, it's as agile above ground in vegetation as it is on the ground. Other adaptations for its above ground pursuits include a bicolored pelage or coat that breaks up its outline to make it look like something less than a tasty mouse. Its vibrissae, or whiskers, are long and act as feelers during its basically nocturnal activities. It has very good dim-light vision, and its large eyes are located near the sides of its head. This provides the mouse with a large field of vision, which can easily spot the movement of predators.

But it is still a mouse, and because of predation, notably by snakes, owls and foxes, and extreme weather conditions and a host of other factors that can be catastrophic to a small mammal, there is nearly complete population turnover each year.

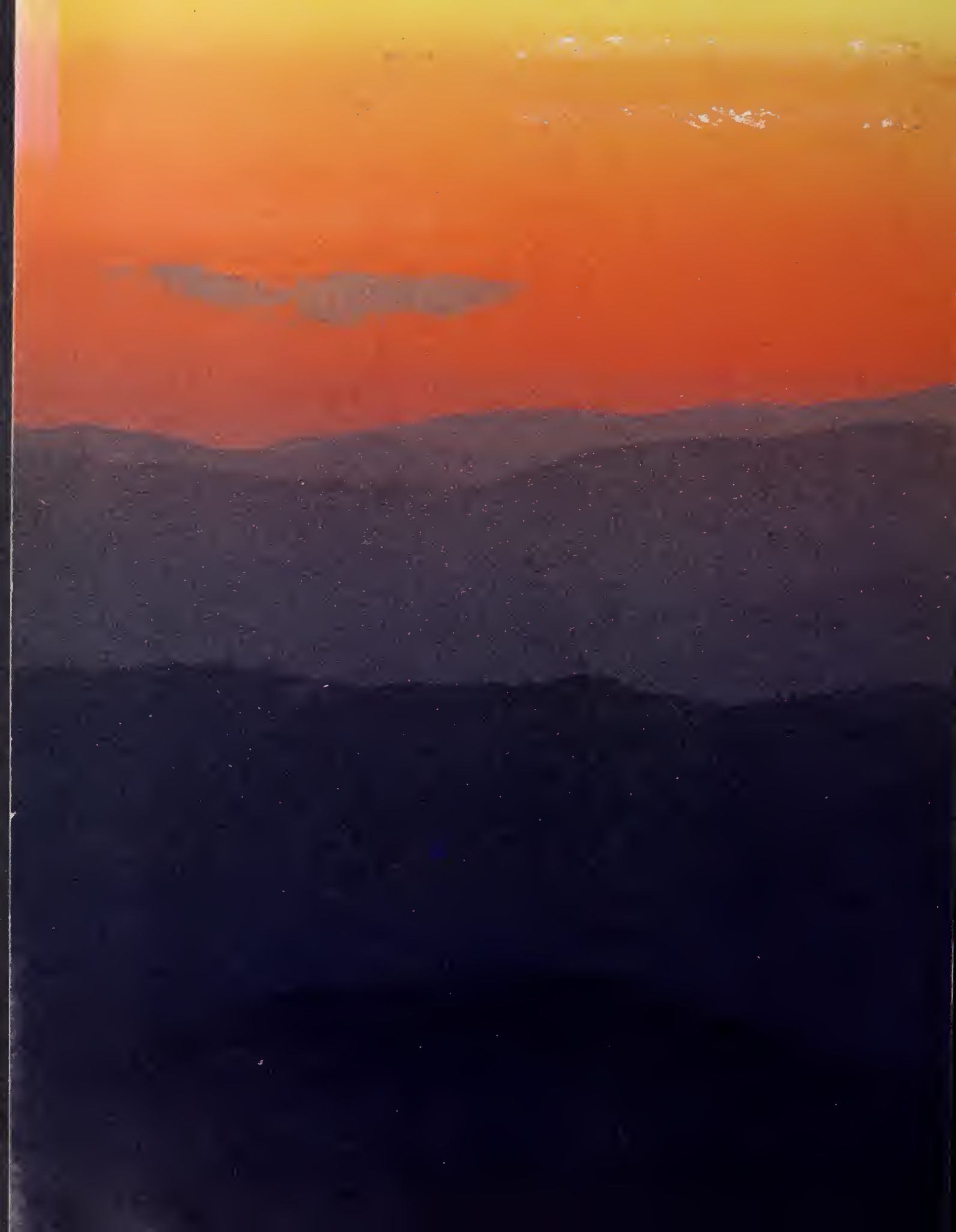
Such a critter must have a high reproductive potential, and it does. It breeds throughout much of the year in Virginia, and three to five pinkies are born after a gestation period of about three weeks. The young reach sexual maturity at 35 to 40 days of age.

Furthermore, the white-footed mouse has a special reproductive strategy, also found in certain other mammals, that includes a post-partum or post-birth estrus. Within minutes or hours after giving birth the female is receptive to males and mates and is thus again pregnant.

If the litter just born survives to weaning age, the growth of these embryos is arrested for up to a couple of weeks and the gestation period for them may be as long as 38 days. If the nursing litter is lost for some reason, for example to predators or some kind of nest destruction, almost immediately the development of the arrested embryos will increase to a normal rate and the lost litter will be replaced soon thereafter.

Nests of the white-footed mouse are located nearly anywhere, from rock piles and hollow trees, to those tall, skinny buildings around campsites. Finely-shredded nest material ranges from mosses, grasses and leaves to hair and feathers, and, if available, paper.

We can all identify with a nice warm nest and curling up into the fetal position to help keep warm. And one doesn't have to read stories about a mouse to know that huddling, cuddling and snuggling can be beneficial in cold situations. Nor do mice have to read such stories. In mid-winter, as many as four or five mice may huddle in a nest, saving energy they would otherwise require if out foraging for food and subject to the rigors of the environment and hungry predators. As a final resort, the white-footed mouse is known to go into torpor for brief periods during times of extreme cold. Again, this is an energy saving mechanism.

Why then do we often have so many mice in the house, especially in mid-winter. Why not? There's shelter, warmth, food—and by the way, because the white-footed mouse is an omnivore, for a holiday treat it would much prefer nuts, fresh fruit and nice juicy insects over a piece of cheese.

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